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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
HAJNIK, DANIEL F	
ART UNIT	**PAPER NUMBER**
2628	

DATE MAILED: 09/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/811,071	FENNEY ET AL.	
	Examiner	Art Unit	
	Daniel F. Hajnik	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 March 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in the United Kingdom on 3/27/2003. It is noted, however, that applicant has not filed a certified copy of application United Kingdom 0307095.0 as required by 35 U.S.C. 119(b).

Claim Rejections - 35 USC § 103

2. Claims 6-8 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greene et al. (US Patent 6646639, herein referred to as "Greene").

As per claim 6, Greene teaches the claimed "subdividing ... into ... rectangular areas" by teaching of in figure 2 where the display 200 is divided into tiles 206 (rectangular areas).

Greene teaches the claimed "testing edge information" by teaching of "Step 1310 performs this test on each edge of the polygon (or until it is determined that the sample lies outside at least one edge" (col 23, lines 46-48).

Greene teaches the claimed "inserting the object ... in dependence on the result of the determination" by teaching of in figure 13, step 1318 "Set status to visible" and in figure 8, step 806 "Report polygon list visible" where the process of marking a polygon as visible is similar in functionality to inserting it into a list of polygons to be displayed for a given tile.

Greene teaches the claimed "shifting the edge information by a predetermined amount in dependence on the orientation" by teaching of:

> *Within Process N.times.N Tile 1300, at every cell it is necessary to* ***evaluate a*** *plane equation of the form z=Ax+By+C at step 1308 and* ***edge equations of the form Ax+By+C=0*** *at step 1310. Coefficients A, B, and C* ***are computed relative to the standard coordinate frame*** *of FIG. 10*

> (col 25, lines 61-65)
>
> *Assuming that N is a power of two,* ***A' and B' can be obtained by shifting****. Frequently, Ax+By+C* ***has already been evaluated at (xt, yt)*** *at step 1308 or 1310 of procedure 1300, in which case C= is already known. Whether or not this is exploited, C= can be efficiently computed since xt and yt are small integers*
> (col 26, lines 43-49)

Here, part of the edge information (A' and B') is shifted by following the graphical edge equation in the form of Ax+By+C=0. The predetermined amount is in dependence on the orientation because the coefficients are computed in relation to the edge's orientation in respect to the standard coordinate system. Thus, shifting will occur along the edge's orientation in relation to the edge equation Ax+By+C=0. Here, the examiner has taken the broad and reasonable interpretation of the edge information to include A' and B' and the edge equations.

Greene does not explicitly teach the claimed "deriving a list of objects ... which may be visible in that rectangular area". However, Greene teaches of in figure 3, piece 304 a 'Tile Polygon List' which keeps track of visible faces of objects associated with each tile (area). Further, Greene teaches of:

> "objects are passed from an input stream to a geometric processor for being transformed"
> (col 6, lines 1-3)
>
> "Tile polygon List 800 processes polygons one by one until all polygons on the list have been tiled"
> (col 31, lines 55-56).
>
> Lastly, Greene teaches in "Determine if any front face is visible with 'Tile Polygon List'" (figure 7, the step 708)

Given these teachings, it would have been obvious to one of ordinary skill in the art to use the claimed limitation because an “object list” would contain the similar information as the disclosed

"tile polygon list" and thus the "object list" could be simply used to save memory by linking the object directly to the tile rather than linking it to one or more faces of the object.

As per claim 7, Greene teaches the claimed "shifting by either the vertical or horizontal dimension" by teaching of "the values of x and y in the equations are small integers, which permits the equations to be evaluated with shifts" (col 25, line 66) to (col 26, line 1).

As per claim 8, Greene teaches the claimed "shifting step is performed using a floating point calculation" by teaching of "Shifting can be used to scale numbers represented in floating-point format" (col 28, lines 33-34).

As per claims 15-17, these claims are similar in scope to claims 6-8, respectively, and thus are rejected under the same rationale.

3. Claims 9 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greene in view of Xavier (US Patent 6099573, herein referred to as "Xavier").

As per claim 9, Greene does not explicitly teach the claimed "shifting means uses a safety margin ... if the edge information falls close to a sampling point". Xavier teaches the claimed limitation by teaching of:

> "Usually, either interference or distance computation queries are applied at closely spaced points on the path. Simple use of interference detection can miss collisions. Growing the objects by a safety margin can prevent this"
> (col 1, lines 49-57)

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Greene and Xavier. One advantage to the combination is provided by Xavier, which teaches of "Exact or accurate collision detection is often avoided for the sake of speed" (col 1, lines 49-50) where collision detection requires an edge detection test. Greene suggests the need for such a safety margin by teaching of "multiple-pass rendering using conservative occlusion culling" (col 5, line 67 to col 6, line 1).

As per claim 18, this claim is similar in scope to claim 9, and thus is rejected under the same rationale.

4. Claims 1-5 and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greene in view of Koneru et al. (US Pub 2003/0122819, herein referred to as “Koneru”).

As per claim 1, the reasons and rationale for the rejection of claim 6 are incorporated herein (in regards to the "subdividing" and "deriving a list of objects" limitations).

Greene teaches the claimed "determine how the rectangular area should be shaded" by teaching of "shading operations may be performed" (col 6, lines 10-12).

Greene teaches the claimed "determining a set of sampling points" by teaching of:

> *To facilitate reading and writing in blocks, the **z-pyramid is organized** preferably in N.times.N tiles, as illustrated in FIG. 2 for a three-level pyramid 200 organized in 4.times.4 tiles. **Each tile is a 4.times.4 array of "cells," which are samples 202 at the finest level of the pyramid** and square regions of the screen 206 at the other levels.*
> (col 11, lines 58-63)

Here, a set of sampling points can change depending on the z-pyramid level needed according to the farthest depth sample in the corresponding region. Further, the minimum and maximum

dimensional values of the size of a bounding box can determine the range of depth values contained within the bounding box. Thus, when this is applied to a z-pyramid, the set of sample points can change according to the depth samples contained within the minimum and maximum dimensional values of the bounding box.

Greene teaches the claimed "determining whether or not a bounding box surrounding the object covers any of the sampling points" by showing in figure 4, bounding boxes labeled 'A' to 'F" around objects and by teaching of in figure 6, step 610 - "Box intersects near frustum face?" where such a step is used to determine which bounding boxes will intersect with sample points associated with the view frustum.

Greene teaches the claimed "adding or rejecting the object from the list in dependence of the determination" by teaching of in figure 6, piece 612 - "Add box to near-box list" and step 616 - "Add box to list of layer L".

Greene does not explicitly teach the claimed "determining maximum and minimum values". Koneru teaches the claimed limitation in figure 7, where the maximum and minimum values are labeled 'bb x min', 'bb y min', and 'bb x max', and 'bb y max'.

It would have been obvious to one of ordinary skill in the art at the time of invention to combine Greene and Koneru. One advantage to the combination is provided by Greene, which teaches of:

> "First, step 902 transforms the polygon's vertices to perspective space. Next, step 904 determines the smallest NxN tile in the pyramid that encloses the transformed polygon"
> (col 17, lines 33-35)

which suggests the need for finding these minimum and maximum values associated with the polygons vertices.

As per claim 2, Greene teaches the claimed "determining whether or not the separation of the sampling points exceeds the resolution of the display... adding or rejection ... in dependence" by teaching of "oversampling with a 4x4 array of depth samples within each pixel" (col 12, lines 15-16) where such an oversampling operation would require the ability to determine when the sampling points exceed the resolution of the display and where such oversampling is used for occlusion culling (col 12, lines 20-22).

As per claim 3, Greene teaches the claimed "the resolution of the display comprises the pixel separation of the display" by teaching of higher resolutions having more pixels (col 12, lines 14-19) where using more pixels would effect the separation between them.

As per claim 4, Greene teaches the claimed "testing each sampling point against each edge of the object ... adding or rejection ... in dependence" by teaching of "Step 1310 performs this test on each edge of the polygon (or until it is determined that the sample lies outside at least one edge" (col 23, lines 46-48) and in figure 13, step 1318 "Set status to visible" and in figure 8, step 806 "Report polygon list visible".

As per claims 5, Greene teaches the claimed "selecting only those rectangular areas which fall at least partially within the bounding box" by teaching of in figure 5, step 506 - "For each box on near-box list, render polygon list with 'Render Polygon List' where only areas are

rendered that fall within the bounding box (box) (also see figure 10 where areas to be rendered appear as shaded).

As per claims 10-14, these claims are similar in scope to claims 1-5, respectively, and thus are rejected under the same rationale.

5. Applicant's arguments filed have been fully considered but they are not persuasive.

Applicant argues:

> Unlike the system and method disclosed in Greene, Claim 6 calls for a method of shading graphics wherein the process of determining whether an object falls into a defined rectangular area includes the step of "shifting the edge information by a predetermined amount in dependence on the orientation of each edge". As a result, the claimed method is able to process an object using a uniform sampling location, e.g., the top left corner of the tile. In contrast, traditional methods such as that disclosed in Green requires the selection of sample points on an edge-by-edge basis.
> (bottom of page 8 and top of page 9 of remarks)

The examiner maintains that the prior art rejections made in regards to the claimed are proper because Greene teaches of:

> *Within Process N.times.N Tile 1300, at every cell it is necessary to* ***evaluate*** *a plane equation of the form z=Ax+By+C at step 1308 and* ***edge equations of the form Ax+By+C=0*** *at step 1310. Coefficients A, B, and C* ***are computed relative to the standard coordinate frame*** *of FIG. 10*
> (col 25, lines 61-65)
>
> *Assuming that N is a power of two,* ***A' and B' can be obtained by shifting****. Frequently, Ax+By+C* ***has already been evaluated at (xt, yt)*** *at step 1308 or 1310 of procedure 1300, in which case C= is already known. Whether or not this is exploited, C= can be efficiently computed since xt and yt are small integers*
> (col 26, lines 43-49)

Here, part of the edge information (A' and B') is shifted by following the graphical edge equation in the form of Ax+By+C=0. The predetermined amount is in dependence on the orientation because the coefficients are computed in relation to the edge's orientation in respect to the standard coordinate system. Thus, shifting will occur along the edge's orientation in relation to the edge equation Ax+By+C=0. Here, the examiner has taken a broad and reasonable interpretation of the edge information to include A' and B' and the edge equations. Further, Greene teaches of a uniform sampling locations by teaching of:

> *In FIG. 2, the image raster is a 64.times.64* ***array of depth samples 202 arranged in a uniform grid****, only part of which is shown to conserve space*
> (col 12, lines 11-13)

Applicant further argues:

> However, in contrast to Claim 1, Greene fails to disclose a method of shading graphics wherein the process determines the minimum and maximum values in the x and y directions for each object, and then determines a set of sampling points from these minimum and maximum values.
> The Office Action asserts that Green teaches the determination of sampling points based upon the vertices of an object, which are based on maximum and minimum calculations, citing Figures 14 and 15 as support. However, upon further review, Applicant believes this cited section does not show the defining of a bounding box around a primitive to be tested, nor the defining of a set of sample points dependent on the maximum and minimum values of x and y of the object within the bounding box. Instead, Greene teaches a well defined method of sampling objects utilizing an "overlap test" as discussed starting at column 23, line 23.
> (page 12 of remarks)

The examiner maintains that the prior art rejections made in regards to the claimed are proper because Greene teaches of:

> *The system is structured to operate with or without "box culling"* ***(culling of parts of the scene that are inside occluded bounding boxes)****. Preferably, densely*

> *occluded scenes are rendered with box culling, since this accelerates frame generation.*
> (col 12, lines 59-64)
> (defining of a bounding box around a primitive to be tested)
>
> *To facilitate reading and writing in blocks, the* ***z-pyramid is organized*** *preferably in N.times.N tiles, as illustrated in FIG. 2 for a three-level pyramid 200 organized in 4.times.4 tiles.* ***Each tile is a 4.times.4 array of "cells," which are samples 202 at the finest level of the pyramid*** *and square regions of the screen 206 at the other levels.*
> (col 11, lines 58-63)

Here, a set of sampling points can change depending on the z-pyramid level needed according to the farthest depth sample in the corresponding region. Further, the minimum and maximum dimensional values of the size of a bounding box can determine the range of depth values contained within the bounding box. Thus, if this is applied to a z-pyramid the set of sample points can change according to the depth samples contained within the minimum and maximum dimensional values of the bounding box.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel F. Hajnik whose telephone number is (571) 272-7642. The examiner can normally be reached on Mon-Fri (8:30A-5:00P).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka J. Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

9/11/06

DFH

ULKA CHAUHAN
SUPERVISORY PATENT EXAMINER